WHAT IS CLAIMED IS:

1. A system for controlling wafer temperature during wafer processing, comprising:

an electrostatic chuck having a clamping electrode;

a RF source configured to be coupled to the electrostatic chuck;

an impedance determining device configured to determine an impedance of a load on the RF source;

a gas flow controlling mechanism configured to control backflow gas pressure to said electrostatic chuck;

a voltage supply arranged to supply voltage to said clamping electrode; and

a wafer temperature control system arranged to control at least one of said gas flow controlling mechanism and said voltage supply based upon impedance measurements derived from the impedance determining device.

2. The system of claim 1, wherein the impedance determining device includes sensors configured to measure voltage and current.

3. The system of claim 1, wherein the impedance measurements are derived for multiple frequencies.

4. The system of claim 1, further comprising a mechanism configured to directly measure wafer temperature during an experimental mode of the wafer processing.

5. The system of claim 1, wherein said voltage supply produces a voltage modulated at a modulation frequency.

6. The system of claim 5, wherein the impedance determining device determines said impedance at the modulation frequency.

7. A system for monitoring wafer temperature during wafer processing, comprising:

an electrostatic chuck having a clamping electrode;

a RF source configured to be coupled to the electrostatic chuck;

an impedance determining device configured to determine an impedance of a load on the RF source; and

a wafer temperature monitor device that determines the wafer temperature based upon impedance measurements derived from the impedance determining device.

8. The system of claim 7, further comprising:

a gas flow controlling mechanism configured to control backflow gas pressure to said electrostatic chuck; and

a voltage supply arranged to supply voltage to said clamping electrode.

9. The system of claim 8, wherein the voltage supply produces a modulated voltage at a modulation frequency.

10. The system of claim 9, wherein the impedance determining device determines said impedance at the modulation frequency.

11. The system of claim 7, further comprising a mechanism configured to directly measure wafer temperature during an experimental mode of the wafer processing.

12. The system of claim 7, wherein the impedance determining device includes sensors configured to measure voltage and current.

13. The system of claim 7, wherein the impedance measurements are derived for multiple frequencies.

14. A method for monitoring wafer temperature during wafer processing, comprising:

measuring an impedance of a load within the wafer process; and

determining a temperature of the wafer based upon the measured impedance.

15. The method of claim 14, wherein said measuring of impedance includes measuring voltage and current in a transmission line of the wafer process.

16. The method of claim 14, further comprising:

setting a backflow gas pressure and a dc clamping voltage to a series of combinations of values;

measuring wafer temperature for the various processing parameters during the experimental runs at each of the combinations of backflow gas pressure and dc clamping voltage;

measuring impedance for each measured wafer temperature;

correlating the measured impedance to the measured wafer temperature to provide correlated data;

comparing the measured impedance and the correlated data to determine a temperature of the wafer; and

controlling at least one of said backflow gas pressure and dc voltage to adjust said temperature of said wafer.

17. The method of claim 15, further comprising modulating at least one of said dc voltage and said backflow gas pressure for at least one selected frequency.

18. The method of claim 17, wherein when the dc voltage is modulated the backflow gas pressure is set to a constant value, and

wherein when the backflow gas pressure is modulated, the dc voltage is set to a constant value.

19. The method of claim 16, wherein the impedance is measured at multiple frequencies during the experimental runs.

20. The method of claim 16, further comprising repeating said setting, said temperature measuring, said impedance measuring and said correlating for a series of sets of different processing parameters and wherein said comparing includes determining which of said sets of processing parameters is most similar to processing parameters for an actual process run.

21. The method of claim 14, further comprising controlling at least one of backflow gas pressure and dc voltage in response to said measuring to adjust said temperature of the wafer.

22. The method of claim 16, wherein the backflow gas pressure is set in a range of 1 Torr to 100 Torr.

23. The method of claim 16, wherein the dc clamping voltage is set in a range of 500 to 2000 volts.

24. A plasma processing system in which wafer temperature is controlled, comprising:

a plasma source arranged to create a plasma for use during the processing;

an electrostatic chuck having a clamping electrode;

a RF source configured to be coupled to the electrostatic chuck;

an impedance determining device configured to determine an impedance of a load on the RF source;

a gas flow controlling mechanism configured to control backflow gas pressure to said electrostatic chuck;

a voltage supply arranged to supply voltage to said clamping electrode; and

a wafer temperature control system arranged to control at least one of said gas flow controlling mechanism and said voltage supply based upon impedance measurements derived from the impedance determining device.

25. The system of claim 24, wherein the impedance determining device includes sensors configured to measure voltage and current.

26. The system of claim 24, wherein the impedance measurements are derived for multiple frequencies.

27. The system of claim 24, further comprising a mechanism configured to directly measure wafer temperature during an experimental mode of the plasma process.

28. The system of claim 24, wherein said voltage supply produces a voltage modulated at a modulation frequency.

29. The system of claim 28, wherein the impedance determining device determines said impedance at the modulation frequency.

30. The system of claim 24, wherein the plasma source is of a type that includes at least one of capacitive-coupled, magnetically-enhanced capacitive coupled, inductive-coupled, transformer-coupled, electron-cyclotron, and helicon.

31. A method for controlling wafer temperature of a wafer on an electrostatic chuck during plasma processing, comprising:

setting a dc voltage and gas backflow pressure to a predetermined value;

measuring a temperature of the wafer on the electrostatic chuck; and

adjusting at least one of the dc voltage and backflow gas pressure based upon the measured temperature to maintain a desired wafer temperature.

32. A system for controlling wafer temperature during plasma processing, comprising:

a device configured to set a dc voltage and backflow gas pressure to a predetermined value;

a mechanism configured to measure a temperature of a wafer on an electrostatic chuck; and

a mechanism configured to adjust at least one of the dc voltage and the backflow gas pressure based upon the measured temperature to maintain a desired wafer temperature.